

ON PEPSINE.

BY

M. BOUDAULT.



TRANSLATED BY

W. STEVENS SQUIRE, PH.D.

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WITH REMARKS BY ENGLISH PHYSICIANS.

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INTRODUCTION.

THE translation of Mons. Boudault's pamphlet "ON PEPSINE" being out of print, it has become necessary to issue a second edition. Since the publication, however, of the first edition, Pepsine has been so extensively used by English Physicians, that an immense amount of valuable information, and experience in the use of this agent has been accumulated by them.

I have, therefore, for the use principally of medical men, but also to a great extent for the benefit of the general public, appended to this edition of Mons. Boudault's memoir, extracts from the writings of, as well as special and original communications from, some of the eminent Physicians who have employed Mons. Boudault's preparation.

W. S. S.

ON PEPSINE.

IN a former paper read before the Academy of Medicine, about a year ago, I described a process for the preparation of Pepsine from the stomach of sheep; and I communicated, at the same time, some of the interesting reactions of this body secreted by the stomach.

As I am able at the present time to procure considerable quantities of Pepsine, both in solution and in a pulverulent state, I have endeavoured to complete the chemical investigation of this substance, and to indicate the most convenient means of employing it in medicine.

I shall cite some well-known facts, and mention results already admitted by science; but, wishing to establish a comparison between *natural Pepsine* and the Pepsine obtained by chemical processes, I think it desirable to bring forward all the reactions, with a view to proving their complete similarity.

The questions which I propose to solve in this memoir are: What are the physical, chemical, and physiological properties of natural and artificial Pepsine, when compared with one another? and, How can Pepsine be administered as a medicine?

I have employed in my experiments, the method proposed by Dr. Blondlot for procuring the natural gastric juice; and by means of fistulæ inserted into the stomachs of a large number of dogs, I have succeeded in procuring a certain quantity of *natural gastric juice*.

I wish it to be understood that by the term *natural gastric*

juice, I mean the liquid product secreted by the stomach, and by *neutral* or *acid Pepsine*, the substance obtained by evaporating the gastric juice, or by precipitating it with neutral acetate of lead.

By artificial gastric juice, I mean the solution, in water, of Pepsine, either neutral or acidified, but obtained from the stomach of the herbivora.

Properties of
Pepsine.

Natural gastric juice deprived, by filtration, of the mucous which accompanies it, and of the alimentary matters which line the coat of the stomach, and which contaminate it when it is collected, is liquid and limpid, while its colour inclines to amber; its density is slightly greater than that of water. Its taste is styptic, and is, at the same time, a little salt. Its odour is characteristic, more especially when it is heated; it then gives off a smell of broth. After it has been exposed for six hours to the temperature of 50° centigrade (122° Fahrenheit), it becomes slightly turbid, and loses its power of digestion. When the gastric juice is pure, it can be kept out of contact of air for many years without alteration, and without losing its chemical and physiological properties. Alcohol precipitates Pepsine from its solution, and separates it from its acid. Absolute alcohol dehydrates Pepsine, and deprives it, if not quite, at least in part, of its property of digesting *fibrine*.

Tannin produces a precipitate in gastric juice; the precipitate does not possess any of the physiological properties of Pepsine. Metallic salts produce a precipitate in the gastric juice; and this precipitate, when decomposed, reproduces the Pepsine, with its physiological properties.

The quantity of water which the gastric juice contains is considerable; it is 97 per cent. of the liquid secretion in its greatest state of purity; there is about 1.25 per cent. of Pepsine. There remains, consequently, 1.75 per cent. for salts, which are always much about the same, but in differing proportions—viz., carbonate and phosphate of lime, chloride of sodium, minute traces of sulphates, and often a trace of ammoniacal salts. Lastly, the gastric juice contains a free acid.

The gastric juice must always be acid to be endowed with

digestive properties. It is, in fact, demonstrated, that the gastric juice is constantly acid in all animals, whatever be their age, species, or even food. We shall have to remark, that the gastric juice is not always acid to the same extent. It is the more so when the food has been much charged with amylaceous principles; we have to determine what is the acid which forms part of the gastric juice.

I shall not seek to revive this great discussion about the presence of other acids, such as acetic acid, butyric, hydrochloric, phosphoric, &c., whether they be in the free state, or in the form of acid salts. I have undoubtedly verified the presence of a certain number of these acids and these salts in the gastric juice, but in very minute proportions, compared to the quantity of lactic acid. It may even be presumed that the acids were set at liberty by the action of the lactic acid upon their salts; it was more especially after the concentration of the gastric fluid that I succeeded in establishing their presence.

Acid of the gastric juice.

The acid in it gives to the gastric juice the reactions of a dilute acid; it attacks iron filings, and decomposes the alkaline carbonates.

It is asserted by many physiologists that the gastric juice is neutral when it is secreted; others, on the contrary, contend that it is secreted in an acid state.

Approaching this question with the combined resources of chemistry and physiology, I have sought to determine whether the gastric juice be an acid secretion or not.

I killed some animals at the time when digestion was most active, and separated from the rennet-bag the mucus with the greatest care; I next removed, with distilled water, all the soluble matters, until litmus paper was no longer reddened; the bag was then scraped, and the cells bruised, and, on treating it again with distilled water, I obtained a perfectly neutral liquid. When this liquid was exposed for some hours in contact with fibrine, to a temperature of 40° centigrade (104° Fah.) no digestion took place. But another portion of this fluid under the same conditions, to which a small proportion of lactic acid was added, yielded, at the end of two hours, complete digestion.

From this experiment, repeated a great number of times upon the carnivora and herbivora, it is fair to conclude that Pepsine is secreted in a neutral state.

As it is admitted that lactic acid is always found in the gastric juice, and is one of the principal agents, let us inquire how the lactic acid is formed. Is it formed from the amylaceous substances by the action of the alimentary matters, or by the action of Pepsine?

Action of Pepsine.

In point of fact, Pepsine has always been considered as a true ferment; but it certainly does not act as common ferments, yeast, for example. It acts upon the alimentary matters by disassociating them, and causing them to undergo an isomeric transformation, so to speak, but not a decomposition.

It is, indeed, already admitted that acid Pepsine—that is to say, gastric juice itself—is able to transform glucose into lactic acid. I have, however, found, by numerous experiments, that neutral Pepsine can act as a true ferment in the presence of glucose, and transform it into lactic acid, and so reconstitute the gastric juice.

In fact, I take a certain quantity of Pepsine in solution and perfectly neutral; I add to it some glucose, and submit the whole to a temperature of 40° C. (104° Fah.), for twelve hours. At the end of this time, I find that lactic acid has been formed; and if I add to this mixture some fibrine, I find that after some hours I have complete digestion. It is therefore perfectly proved that, by means of neutral Pepsine, we cannot obtain digestion, and that with Pepsine and glucose no immediate digestion takes place; it does not act, in short, until the glucose is converted into lactic acid.

This experiment will naturally lead us to explain the presence of a notable quantity of lactic acid in the gastric juice. The amylaceous matters are transformed by the salivary diastase into glucose, which is thus found in the stomach in considerable quantity, and the Pepsine determines its conversion into lactic acid.

The other acids can certainly play the same part as lactic acid in the stomach, when this acid is deficient; but we have never

obtained such complete artificial digestions with Pepsine acidified by hydrochloric and acetic acids, as we have with Pepsine acidified with lactic acid.*

We have described the properties of natural Pepsine, and we have now to examine those of artificial Pepsine, and to follow them in all their reactions.

The idea naturally occurred to me to inquire, whether the natural Pepsine obtained from the gastric juice of carnivora and that obtained from the stomach of herbivora, have the same chemical composition in 100 parts. Identity of Pepsine in carnivora and herbivora.

I have tried for a long time to obtain Pepsine chemically pure, by employing either the gastric juice from the stomachs of dogs, or the rennet-bag of sheep. But it was difficult to obtain twice running a product which had the same per-centage composition. I obtained products, physiologically speaking, perfectly similar, and the chemical reactions of which were precisely the same; but, when I submitted them to ultimate analysis, I found discrepancies so great, either in the nitrogen, the carbon, or the water, that I was unable to arrive at any exact per-centage formula. Whenever I arrived at great purity of product—that is to say, had isolated it completely from the salts and acids—it lost its physiological properties.

In order to prove the perfect similarity of the two Pepsines, I was obliged to have recourse to its physical and chemical, and especially its physiological, properties.

I have taken as a standard of comparison, or rather as a normal type, the gastric juice of the dog, obtained under the following conditions, and in all cases, from healthy animals. The food which these animals received was always equal in weight, and always contained the same amount of nitrogenous matter. This food was administered every day at twelve o'clock; and on the day on which I wished to collect the gastric juice, in place of giving them their usual food, I caused them to eat tendons of beef, which had been boiled for a very long time in water, and

* This is an oversight, for hydrochloric acid succeeds quite as well, if not better, than lactic acid.—ED.

subsequently well washed, so that no matter remained which could rapidly dissolve in the stomach of the animal.

I dried them in a stove, cut them into small pieces, and then administered them to my animals.

I attached to the canal corresponding to the stomach, an Indian rubber bag, and I collected, under these conditions, a gastric juice nearly always identical, that is to say, possessing the properties I have indicated above; and especially that of digesting a definite quantity of fibrine by a definite weight of juice; that is to say, 100 grammes of the gastric juice of the dog ought always to digest 40 grammes of desicated fibrine, when submitted for four hours to a temperature of 40° centigrade.

I thus found it easy to make all my comparative experiments.

Having a certain quantity of artificial Pepsine in solution in water, I was able to reduce it to the normal type—that is to say, to proportion its digestive power, by adding water if it was obtained too concentrated, but, on the contrary, evaporating at a gentle temperature if it did not digest the same quantity of fibrine as the juice of the dog.

It is, then, by making numerous artificial digestions, of course always under the same conditions, and by comparative digestions made with the gastric juice of the dog, that I succeeded in obtaining a Pepsine similar to the normal type.

In the preparation of Pepsine by chemical processes, the greater part of the lactic acid is eliminated. This acid must be restored, and the gastric juice of the dog will again serve as a standard of comparison. By means of a standard solution of litmus, I succeeded in proportioning the quantity of acid very nearly, and in determining the quantity which should be added to artificial Pepsine, to give it all the properties of the gastric juice of the dog.

In fact, I found that its amber colour and its density were the same, and its odour might be confounded with that of the juice of the dog. But one of the most important chemical and physiological characters which they have in common, is, that when maintained for six hours at a temperature of 50° C. (122° Fah.), chemical Pepsine decomposes in the same manner as the natural.

It becomes slightly turbid, and loses its digestive properties. It may be kept for an indefinite time if air be excluded, and when the bottle is opened it resists putrefaction as long as the gastric juice of the dog, if the proportion of lactic acid is not augmented.

I have seen, likewise, that alcohol precipitates it from its solution; tannin does the same; the salts of lead and mercury produce abundant precipitates, which can, by their decomposition, again reproduce the Pepsine.

Thus far I have succeeded in proving an entire similarity between the properties of the two Pepsines. Let us now compare the products of digestion, in order to leave no doubt upon this subject; but first I will describe how I obtained my artificial digestions, and, consequently, under what conditions I tested comparatively my two fluid Pepsines.

Products of
digestion com-
pared.

I brought into contact definite quantities of fibrine and of gastric juice in small flasks, the necks of which were furnished with a bent tube dipping into lime-water. These flasks were submitted to a temperature of 40° C. (104° F.) for four hours, in a water-bath. The flasks were agitated as often as possible; at the end of this time the fibrine was entirely digested, and the resemblance of the two products was apparent at first sight.

In order to imitate as much as possible the natural conditions, I employed bags of Indian rubber as thin as possible, having the form of pears and very long. These bags were introduced into the stomachs of the dogs through the fistulous openings. In these bags I placed the substances to digest, some containing the natural, others the artificial Pepsine, and in the same proportion as in the first experiment with the flasks. The digestions took place just the same, only quicker, in consequence of the peristaltic movement.

Not satisfied with these almost natural means of obtaining the products of digestion, I have had recourse to the natural functions. I deprived a dog of nitrogenized food for some days, and I satisfied myself that the stomach was perfectly free from alimentary matters, and that the gastric juice which passed through the fistula in the stomach was perfectly normal. I then ad-

ministered to this animal a tolerably large quantity of fibrine ; digestion took place rapidly, and I succeeded in collecting a viscous fluid, which I could compare with those previously obtained. Let us now examine these different products of digestion.

When a digestion is complete, it should not precipitate by boiling. The assimilable product is then soluble in water—it is one of the most certain tests for distinguishing a product of digestion from a simple solution of fibrine in diluted acids.

All the various products of digestion obtained under the different conditions described above, possessed this property : when boiled they did not precipitate ; they perfectly agreed therefore in this respect. When subjected to various chemical reactions, they gave results precisely similar. Precipitation was produced by salts of lead and mercury, by tannin, by alcohol, and the solution was coloured by nitric acid ; in short, the Pepsine of the juice of the dog, and the Pepsine obtained by chemical processes, gave perfectly similar products of digestion.

If we compare the solution of fibrine in acids with the digestions thus produced, we no longer obtain the same reactions.

To obtain digestion, we must have the combined action of acid and Pepsine. The acid acts first ; it disintegrates, it diminishes the aggregation of the fibrine ; then comes the Pepsine, and finishes the digestion. I have employed the process of M. Longet for comparing the products of digestion. This most ingenious process consists in adding a mixture of glucose and bitartrate of copper and potash (the solution of M. Barreswil) to a nitrogenized product of digestion. If the digestion is complete, there is no reduction of the salt of copper by the glucose ; in short, the nitrogenized nutriment masks the glucose.

In fact, when a definite quantity of M. Barreswil's solution and a definite quantity of glucose are brought into contact with a solution of the product of digestion, the liquid becomes violet, and does not change by ebullition. If the quantity of glucose is much increased, a reduction then takes place, but still no pre-

cipitation, such as we obtain from a mere mixture of glucose and bitartrate of copper and potash.

This experiment was repeated with the products of digestion obtained both by the chemical Pepsine, and with that obtained from the dog, the result being perfectly similar, even to the violet colour. In this case, as in the others, we may come to the conclusion that the products are identical. I think that I have now shown the perfect similarity, not only in the chemical and physical properties of the two Pepsines, but even in their physiological properties. We shall therefore be justified in substituting one for the other.

M. le Dr. Corvisart, in his paper upon nutriments and aliments, first proposed to employ Pepsine in cases of dyspepsia. It is necessary to obtain a large quantity of Pepsine to use as a medicine, and most important to have it uniform. As we are able to replace the Pepsine of the carnivora by the Pepsine of the herbivora, the question is solved.

It remains only to determine in what form we can administer this new medicine.

I have stated above that acidified Pepsine is soluble in all proportions in water, but we have likewise seen that these solutions change very easily, if they are exposed to the air. It would therefore be difficult to keep them in this state. Again, the taste is not very agreeable and there would be a great repugnance on the part of invalids to take the liquid Pepsine, even if it were associated with sugar, or with substances capable of masking the taste.

Objections to
Pepsine in a
fluid form.

I have therefore sought for a means of exhibiting this medicine without the inconveniences I have pointed out. After many researches, I have concentrated the Pepsine to a syrupy consistence; but it attracts moisture, and does not keep better than when more diluted with water. I have therefore sought for a body that I could so incorporate with it as to enable me to reduce it to powder.

It is especially necessary that this body should be tolerably inert; it should not alter the Pepsine, and at the same time the

Pepsine should not transform it into nutriment, or rather it should not act upon it as a true ferment. This body should likewise be able to absorb the humidity of the Pepsine, without, however, being so hygrometric as to attract moisture from the air.

Best form for
administration.

I have had recourse, after a number of trials, to starch, powdered and dried at 100° C. (212° F.)

Starch does not undergo any change in contact with Pepsine; it fulfils all the conditions that we wish for, and more, it does not interfere in any manner with the digestion.

Mixed with starch thus dried, the Pepsine can be reduced to powder and preserved in well-closed bottles; it undergoes no alteration, and may be kept indefinitely without losing its physiological properties.

Its disagreeable taste is singularly modified, the odour only remains, and it is diminished in consequence of the dryness of the product.

The amount of starch to be added should always be specially determined, otherwise we should not obtain a product possessing constantly the same digestive power. Now it is of the utmost importance that a medicine should always have the same properties. I have once more availed myself of artificial digestions to determine the digestive power. I add, in fact, starch gradually in such quantities to the Pepsine that a gramme (fifteen grains) of the mixture is in a position to digest four grammes of dry fibrine, or that it will in the stomach cause the meat of a mutton chop to be digested.

Cases where
Pepsine is suitable.

It is in cases of want of appetite, of sluggish and painful digestion, of diarrhœa, and of vomiting, in the weakness of stomach, which still remains at the commencement of the convalescence of severe fever, and in the course of most chronic diseases, lastly, in consumption arising from want of nourishment, that Pepsine is indicated as a powerful digestive agent.

It may be administered either in the acid or neutral form.

Pepsine No. 1,
or acid.

When acid, it possesses all the properties of gastric juice, and may be exhibited in all those cases where there is not too much acid already in the stomach. On the contrary, when diseases of

the stomach give rise to an excess of acid, it should be administered in the neutral form: I will not say chemically neutral, Pepsine No. 4,
or neutral. but neutral at least if compared to the former.

Pepsine can easily be taken before meals enveloped in a small piece of unfermented bread;* if it is taken in the first spoonful of soup, care should be taken that the temperature does not exceed 45° C. (113° Fah.), otherwise its digestive properties will be inevitably lost. After meals it may be taken in syrup of cherries† which entirely masks the taste.

I have endeavoured to give Pepsine in the form of a syrup, as it is as easy to obtain a definite solution in syrup as it is to mix it with starch; but I found that after a short time a very decided action took place of the Pepsine upon the cane sugar.

Pepsine mixed with cane sugar, and allowed to remain for several days, ten or twelve for instance, transforms it into glucose, and finally into lactic acid; it acts as a ferment. And certainly it is impossible for any salivary diastase to be present in the Pepsine which we prepared, as it was obtained not from the compound fluid found in the stomach, but from the mucous membrane previously well washed. It was therefore impossible to prepare this mixture of Pepsine and syrup of cherries in advance.

Pepsine can be mixed with certain medicines which do not modify its digestive properties in the least.

Hydrochlorate of morphia, in the proportion of 1 centigramme ($\frac{1}{4}$ grain), at a meal, may be added to Pepsine in cases of severe Pepsine No. 2. pain in the stomach.

Strychnine, in the proportion of 3 milligrammes ($\frac{1}{20}$ grain) per Pepsine No. 3. diem, is given in cases of want of peristaltic movement.

Other medicines, such as subnitrate of bismuth, lactate of iron, carbonate of iron, iodide of iron, and reduced iron, may be mixed with Pepsine, and do not in any way alter its properties.

I have endeavoured to show that chemical Pepsine, or "*poudre nutritive*," can in every way replace the Pepsine of the

* Or between two thin slices of common bread.—ED.

† As syrup of cherries is not generally kept in this country, the syrup of orange, lemon, or mulberries may be substituted.—ED.

gastric juice of animals, and that it can be employed as a medicine.

Clinical experience has fully confirmed this idea, and artificial Pepsine may now be employed in those cases where there is a deficiency of gastric juice, for the animal economy derives the same advantage as if the stomach had secreted a natural juice.

277, OXFORD STREET, LONDON,

28th January, 1857.

Extracted from the LANCET, October 1st, 1857.

PRACTICAL LECTURES ON THE MANAGEMENT OF THE DIGESTION IN DISEASE.

Delivered during the Summer Session of 1857, at St. Mary's Hospital,

By T. K. CHAMBERS, M.D., M.R.C.P.,

Lecturer on the Practice of Medicine at St. Mary's Medical School, and Physician
to the Hospital.

LECTURE VIII.—ON PEPSINE.

THE attempt to turn the peculiar powers of gastric juice to ^{History of Pep-} advantage in medicine, dates from remote antiquity. Pliny ^{sine.} mentions the fluids of the stomach of sucking animals as a remedy in common use for a variety of purposes, such as curing disorders of the intestines, allaying the inflammation from spiders' bites, stopping bleeding from the nose, preventing snakes attacking you, and in fine against poisons in general.* Galen, arguing probably on physiological grounds, attributes a "digestive" and "drying" power to it. He mentions having experienced in his own person the relief afforded by it to the weight at the epigastrium after drinking too much milk, and advises a trial of it in abdominal disorders. He remarks that the stomach of one animal differs from another only in degree of power. He gives a warning also that the boiling temperature destroys its virtues, as we now well know; for he found that hens' and cormorants' stomachs, when cooked were perfectly inert.†

On the strength of his rational advice the coagulated milk and fluids taken from the paunches of several young animals was a remedy sufficiently often used to retain a place in European

* See the places referred to in any good index to Pliny's Nat. Hist. article "Coagulum."

† Galeni de Simpl. Med., x. 11; xi. 13.

Pharmacopœias up to the first quarter of the last century. This is the explanation given by Dr. Schroder, a Dutch pharmacologist, who wrote in 1672,* of the method of preparing, and the reason for using "*Cougulum leporis† hædi, agni, equi, &c.*"

The disagreeable nature of the remedy in this form probably drove it out of use, for the last London Pharmacopœia in which it appears is that of 1677. In the edition of 1721, the only representative of gastric juice is the mucous membrane of the hens' stomach—*Pelliculæ stomachi gallinæ interiores.*‡ In 1746 this also had vanished, along with "*stercus bovinum, humanum, pavonis,*" and various similar remedies which patients had got too civilized to submit to, without at least knowing the reason why. Thirty years later, the immortal experiments of the Abbé Spallanzani threw a bright new light into the subject of digestion, and taught the true nature of the gastric juice. With much juster views than of old, its use in medicine was again recommended. Dr. Mongiardini, at Pavia, a pupil of Spallanzani's, at his master's instance, treated indigestion successfully with the gastric juice of crows. Another pupil employed it as a lithontriptic, to break down calculi by destroying the animal matter which holds them together. M. Senebier, a clerical pupil, suggested that its antiseptic power might make it useful in surgery, and advised a trial of sheep's paunch as an application to ill-conditioned wounds.§ M. Boyer, of Strasburg, found that it destroyed the poison of the viper, and thought it might be an antidote to snake bites.||

* Pharmacopœia Medico-Chimica. Amstelodami, 1672.

† The rennet of the leveret is now usually wasted, but the Roman dairy-maids preferred it to that of any other animal for making cheese. Varro ranks it as the best, then that of the kid, then of the lamb. (Varro de Re Rusticâ, lib. II., xi. 4.) The Roman physicians also had the same preference. Quintus Sammonicus, in a prescription for "colus" (colic), says, "*Aut pavidi leporis madefacta coagula pota.*" (Sammonici de Medicinâ Præcepta, "De colo compescendo.") This accounts for its being named in Pharmacopœias which omit other rennets, as, for instance, in the Vienna priced drug list of 1613 and 1646, in which its price varies from six to sixteen kreutzers the half-ounce.

‡ This is another Italian expedient for coagulating milk rarely used now. Palladius recommends it for making summer cheeses, when you cannot get leverets.—Palladius de Re Rusticâ, Mensis Mains, ix.

§ Expériences sur la Digestion de l'Homme, par l'Abbé Spallanzani, avec des Considérations, &c., par Jean Senebier. Genève, 1783.

|| Falck, Handbuch de Arzneimittellehre, vol. i., p. 275

But with all the obvious advantages with which the remedy recommended itself to the physician, there was the insurmountable difficulty of obtaining it in a form fit for general use internally. It was of course necessary to administer it at the same time with the food, and any nauseating substance then given does more harm than good by taking away the already squeamish appetite. Dr. Latham, who practised in Paris some years ago, informed me that Laennec had a preparation of concentrated gastric mucus, which he recommended with great enthusiasm.

But the matter showed itself in quite a new light when an ingenious French pharmacien, M. Boudault, made the very elegant and agreeable preparation, now so well known to the profession as "*poudre nutritive*." It is simply Pepsine from the sheep's stomach dried on starch, with lactic acid, added or not according to circumstances. When, one day in the autumn of last year, Dr. Waller Lewis showed me some of this powder he had brought from Paris, I saw in a moment that it was what we had been so long wanting, and instantly ordered a kilogramme over for experiment. You have since that time seen me prescribe it to numerous patients in the wards, and I have also employed it frequently in private practice, so that I think we are in a position now to form an idea of its value to the practical physician.

The cases in which I have administered it with advantage are six of phthisis pulmonalis, one of cancer near the pylorus, two of gastric ulcer, one of hysterical vomiting, two of nausea, one of hysterical pain after eating, two of atonic pain after eating, one of atonic gout, one of dilated stomach, one of gastric flatulence, three of low fever, and two of pneumonia. In these all the benefit which physiological reasoning would lead us to expect from the remedy has followed.

I have also injected it *per anum*, mixed with food, in a case of ulcerated œsophagus, and in a case of manio-hysterical vomiting and dysphagia. But in neither did it appear to delay death. Probably the ilia are the only part of the alimentary canal capable of absorbing chyme.

Several other cases of atonic pain after eating, in which I

have given Pepsine, I have not since heard of, but probably should have done so had any harm happened.

In one case of chronic dysentery it caused nausea and obliteration of appetite. In one case of consumption, and in one of pendulous tumour of the abdomen (attached probably to the pylorus), it purged the patient. These are the only instances of inconvenience that I have been able to assign to the remedy.

The phthisical cases have been those where a progressive anæmia was accompanied by an inability to digest meat or other albuminous food. This inability is exhibited in three ways: first, by the eating of such diet, even in very small quantities, being followed by a sense of great weight and oppression at the epigastrium, and sometimes by actual vomiting; secondly, by the passage of loose fetid stools containing much unaltered muscular fibre, lumps of fat, and such like remnants of a former meal; thirdly, by entire loss of appetite and an instinctive nausea excited by the bare idea of flesh food. Often all three phenomena exist together; but each one may be found separately, and is of itself a sufficient indication of the patient's state.

Pathological
explanation.

The pathological explanation of these symptoms is an excessive secretion, in the upper part of the alimentary canal, of alkaline mucus, which envelopes the food, and prevents the action of the gastric juice upon it. The consequence is, either its rapid ejection unaltered, or its decomposition, and the evolution of fetid gas. If vegetable food be mixed with the meat, it ferments into lactic and acetic acids, and thus you may have acid eructations from the stomach, and acid diarrhoea arising out of the want of acid gastric juice. If this excessive secretion of mucus is recent and moderate, the appetite may remain uninjured, nay, may sometimes be morbidly increased; but a long continuance, joined to progressive pulmonary disease, is sure to induce an anæmic condition of the alimentary canal, which results in a disgust for food.

Now this state of things it is very important to check. If it goes on, the patient cannot take in sufficient quantities the meat which should refresh his degenerating muscles and pale blood, he cannot take the cod-liver oil which is to replace his emaciating

tissues ; he cannot, from weakness, take the exercise which might renew his whole diseased system. And I do not know any remedy which more readily, obviously, and directly does what it can towards checking it than Pepsine. It does immediately and surely what it can ; but then that is not very much. Do not raise your expectations of its powers too high, or you will be disappointed. Understand clearly what position this agent holds in the rational *Materia Medica*, and then you will know what good results you may demand with reasonable hopes of obtaining them. It is an *artificial*, and therefore a *partial*, substitute for a *natural* process. Gastric juice prepared by a healthy animal is mixed with the food, instead of that which the patient's stomach ought to prepare. And it acts in the body just as it would out of the body under the same circumstances of heat and motion. The chewed meat is dissolved by it, just as you see the white of egg suspended in this beaker dissolved by it ; and the putrefactive process is arrested by it in the intestinal canal just as you perceive the putrefactive process is arrested by it in the experiment under our eye. For you may observe that this albumen suspended in Pepsine is quite sweet, whereas that soaked for the same time in saliva is most fetid. It is, therefore, a substitute for the natural secretion, and to a certain extent supplies its place. But, like all imitations of nature, it is coarse and imperfect. The solvent, instead of being gradually and continuously poured on to the outside of the mass of food, is mixed up in the middle of part of it, and acts merely chemically, without any of the mechanical and physiological helps belonging to natural digestion, and consequently soon exhausts its energies. The chyme, or albumen prepared for absorption, instead of being wiped off, and swept away by the stomach, remains for some time mixed up with the Pepsine, so that the latter is not freed for the solution of a small portion. By this imperfect process only a very small quantity of meat can be dissolved at once.

Hence, if you hope that by administering Pepsine with it, you can get a full and sufficient meal eaten at once by your consumptive patient, you will fail. Give half a mutton chop with the remedy

Practical
remarks.

the first day ; and if that is digested well, try a whole chop the next ; but remember, then, you have got to the end of your tether, and that the digestion of a larger quantity will not be at all assisted by artificial solvents. Also, after a chop has been digested and absorbed twice, or even once, a day by this means for about a week or ten days, the expedient has probably done all the work that can be asked of it, and the stomach has either recovered sufficient energy to digest alone, or will require different remedies to enable it to do so. Therefore, for the Pepsine to be completely successful in these cases—first, it must be given only to those who cannot digest half a mutton chop without it ; secondly, more than a chop must not be given at once ; thirdly, it must not be required to go on alone improving the patient's condition for more than a week or ten days.

But for the time named, I do advise its being given alone, and the action not interfered with in general by other drugs. Many will really prevent its chemical effect, and all will confuse your judgment of the advantage gained. In this time you will generally find that the repugnance of the patient to meat has been overcome, and that a small quantity of it at a time can be relished and digested ; the morbid fœtor of the stools diminishes, and the flatulence and distress arising during their passage through the bowels ceases. A renewed strength and a renewed power of assimilation commence, the sleep becomes more natural, with the diminution of night-sweats and hectic ; while, at the same time, the pulmonary symptoms of cough, dyspnoea, &c., relax, and a step at any rate is taken in the right direction towards the cure of the disease. It is remarkable, too, what a slight improvement in the digestive powers will often enable iron and cod-liver oil to be taken. These drugs are, you know, the main stays in the treatment of tubercular consumption, and any expedient, however temporary, which will pave the way for their administration, is a great boon.

Consumption.

It would not suit the plan of the present lectures to quote in detail these consumptive cases. They differ much from one another in their unessential characters—namely, in the stage of the disease, their ages, sexes, and general phenomena ; while they

are closely similar in essential points—that is to say, in those which I have described as indicating a mucous condition of stomach, preventing the gastric juice being poured out on the food, and finally leading to anæmia and atrophy of the secreting membrane. They resemble one another also in exhibiting an immediate and uniform amelioration of limited extent. In one man, who had loss of voice apparently from erude tubercle in the lungs, with ulcerated trachea, the amelioration of voice and cough continued so long, that I let him remain three weeks taking Pepsine alone without other drugs; but, then, he also continued to improve more afterwards on cod-liver oil, so that he might just as well have commenced it sooner. In another, who had tubercular ulcers in the bowels, afterwards fatal, there was an idea that the Pepsine caused a relapse of diarrhœa; but I suspect the coincidence was accidental. These are the only instances where it appeared to do more good or less good than I have attributed to it.

The case I alluded to of cancer near the pylorus is a type of a Cancer of pylorus. disease necessarily fatal, being still worthy of the careful attention of the medical man. When the patient came under my care, she was unable to keep anything at all on her stomach, every solid, and even an ounce of beef-tea, was vomited unchanged within half an hour of its ingestion. She had been taking prussic acid, soda, creasote, opium, and a variety of remedies without benefit; and, as might be expected, was dying rapidly of starvation. I ordered her immediately half a mutton chop, with fifteen grains of Boudault's "*poudre nutritive*," twice a day, and an ounce of milk and lime-water every two hours. She kept all that down; it passed the pylorus, and nourished her so far that she had a good night's sleep, and the next day was able to take a whole mutton chop. So she went on for three weeks, gaining flesh, losing her pain, and acquiring a cheerfulness about the future unwarranted by the gloomy prognosis which truth compelled me to give her. So far all was right: reason had reasoned well. But I feel it a duty to tell you the mistakes I make, as much as the occasions on which I act wisely. And I find recorded in my note-book a warning, which I advise you to profit by, of the importance of "letting well alone." The patient had from the first, jaundice,

with pale stools and bilious urine ; and now, I thought, had sufficiently recovered strength to bear an endeavour to make the liver clear the blood of its bile a little more briskly. I, therefore, gave her some nitro-hydrochloric acid, which is often of great use under similar circumstances. But the result was most unfortunate. The vomiting returned with violence. The drug was discontinued, and it stopped, but not before the ground gained had been lost. Then, again, contrary, I must say, to my wish, it was judged expedient to give the patient mercury, and she rapidly sank. The jaundice was then proved to be dependent on cancer of the gall-bladder. Now, here it is impossible not to allow that life was prolonged by artificial Pepsine, and would have been further prolonged but for the Anglo-Saxon propensity in both physician and patient for continuous improvement.

Hysterical
vomiting and
nausea.

In one case of hysterical vomiting, and two of nausea preventing due quantity of food being taken by hysterical persons, this remedy has appeared to enable the patient to swallow meat. The mere nutriment thus imbibed has improved the appetite for future meals ; and the valerian and salt sponge-baths afterwards administered seemed to have a more rapid effect than without it. The rational explanation of its good influence is, that both in hysteria and anæmia, the secretion of gastric juice is apt to be irregular and deficient, and that the morbid processes here act, as is so often the case, in a circle ; the non-secretion of gastric juice still further starving the blood and aggravating the hysteria and anæmia, and that further aggravation again diminishing the secretion. But once breaking the magic chain, and enabling even a single meal to be well digested, begins a march toward health which it is comparatively easy to guide afterwards.

Atonic gas-
tralgia.

Closely connected with the last-named complaints is, in the female sex, atonic gastralgia. Indeed, I may say it is practically identical. At the same time that the gastric juice is imperfectly secreted, the muscles of the stomach refuse to perform the peristaltic motions with sufficient activity. Hence not only is the alimentary mass a greater inconvenience than it ought to be, but it actually lies longer than usual in the first portion of the canal, as may be found on percussion of the epigastrium. It is a common

consequence, in the educated classes, of excessive mental and sedentary labour. Where this is very great, I have found Pepsine of some use; but in the slighter cases, which more frequently come before us, I have not seen any apparent benefit accrue from it. A change of habits is here the only permanent remedy, and of drugs strychnine is the most efficacious. I see that M. Boudault prepares a powder in which strychnine is combined with Pepsine and lactic acid. I presume it is for this sort of cases that it is intended, but I do not like mixing up prescriptions in that way, and prefer the strychnine alone, as it is the real active ingredient.

In a case of diarrhœa and mucous vomiting, occurring in an old victim of atonic gout, the stools became more natural and less frequent, and strength was regained, on taking Pepsine and mutton chops instead of opium and acetate of lead.

As cases of acute disease have an innate tendency to get well, they are not of course such good tests of the essential benefit derived from remedies. And it is only by comparison on a large scale that one could speak of fever and pneumonia being benefited by Pepsine. There seemed, however, in those alluded to, an immediate improvement to take place in the appearance of the tongue and of the evacuations; and it is impossible not to think that the amelioration thus evidenced of the alimentary canal would conduce to lessen the mortality of the disease.

On the whole, then, I cannot but conclude that we have in artificial Pepsine a valuable and safe remedy, and an important aid to national medicine.

The way in which I have given it has depended on the diet on Dose. which the patient is. If regular meals are eaten, then it is best taken spread as a sandwich between two thin slices of bread at the commencement of the dinner. Fifteen grains of the starchy powder is the usual dose for an adult. If the patient is so ill that the food is obliged to be administered more frequently and in small quantities, so as to keep up a continuous supply, smaller doses of the Pepsine powder may be given in a draught every four or five hours.

From DR. BALLARD.

42, MYDDLETON SQUARE, E.C.

Nov. 24th, 1857.

DEAR SIR,—The second edition of my little work on “Artificial Digestion.”* was just out of print, when I received your note, in which you invite me to append to your translation of M. Boudault’s pamphlet, any observations that I may be disposed to make, respecting the results of my more mature experience of the use of Pepsine, in the treatment of disease. My first edition was published just twelve months ago, when Boudault’s preparation was scarcely known here, and it is highly satisfactory to me to find that the medicine which I was then instrumental in introducing to the Profession in this country has so rapidly attained a position amongst our established remedies. Thus my object has been attained, the medicine has been extensively used, and its value tested, and consequently any further issue of the work appears unnecessary. At the same time it is not to be concealed that, like every other new remedy laying claim to remarkable powers, its reputation has been endangered by the indiscriminate manner in which it has frequently been prescribed. This error has arisen from overlooking the fact that its operation is restricted to the fulfilment of *one* indication, and of one only—the expectation that it will do more than act as a substitute for a deficient gastric secretion, can only lead to disappointment. As therefore I have determined upon withholding any further publication of my own upon the subject, I avail myself gladly of the opportunity you kindly afford me of protesting against this abuse of the remedy,

* *Preface to the Second Edition.*—It is gratifying to find that the subject of Artificial Digestion has excited the interest of the Profession. Nothing that I can add will enhance the force of the facts already put forth, nor have I seen any reason as yet to modify the opinions which those facts have led me to form.

I take this opportunity, however, of warning those who propose adopting this method of treatment, of the spurious character of some of the “Poudre Nutrimentive, or Pepsine” which is sold. To avoid disappointment, it should be tested as to its transforming power before administration.

42, Myddelton Square, Jan. 1857.

and of pointing out briefly the class of patients for whom I have used it with success, and who may fairly be expected to benefit from its administration.

Passing over the *nature* of the change which the food under-^{Digestion: its nature.} goes in the process of gastric digestion, and assuming that, unless this change be undergone, alimentary matters are incapable of supplying nourishment to the body, I may just say, that in the healthy state the change is effected by admixture in the stomach with "gastric juice," the more essential constituents of which, in addition to water, are an acid, either lactic or hydrochloric, or both, and an azotized substance of the nature of a ferment, to which the term "Pepsine" has been applied. After the secretion of the gastric fluid, the mucous membrane of the stomach has no more to do with the process; all that is necessary beyond this lies in an appropriate temperature, and just that mechanical agitation which the healthy stomach imparts to its contents. I am now speaking of the protein articles of food, and especially of animal food, of that food which chiefly maintains the fabric of the body, and not of the oleaginous and amylaceous elements which have a different purpose to serve, and which undergo in the alimentary canal a change of a different character.

It is well known to physicians that the changes in the food^{Dyspepsia and apepsia.} which I have referred to, are in disease sometimes arrested; they take place imperfectly, or do not take place at all. The pathological designation of the lesser failure is *dyspepsia*, of the greater *apepsia*; the results local and constitutional are to a certain degree alike, differing, however, in degree, and the symptoms varying according to the presence or absence of certain recognized local conditions, the temperament of the sufferer, and other circumstances.

The more important causes of this failure are debility, especially of old age, and that which accompanies and succeeds severe diseases, anæmia, and structural changes which involve the secreting tissue of the stomach.

One class of results arising out of imperfect secretion of gastric juice, pertains to the stomach itself. The leading disturbances thus referred to, are anorexia, a sense of discomfort, weight, or

Unhealthy digestion.

absolute pain accompanying the tardy changes in the aliment; chemical alteration of the nature of decomposition in the aliment, with the production of abundance of gas and acid matters; and, lastly, vomiting, the food sooner or later being thrown off from the stomach in an undigested or almost undigested condition. Where, from any cause, the stomach is abnormally sensitive, the pain may be almost intolerable. Other sympathetic disturbances may be conjoined, such as overpowering lassitude, headache, tendency to sleep after meals, feverishness, &c.

But the evils consequent upon aepsia may not only be gastric but intestinal also; the latter may even be the more prominent of the disturbances. It is in young infants and in early childhood that we principally meet with this result. The undigested food, passing along the intestinal canal, acts there as an irritant poison producing, beside vomiting, diarrhœa and colic. In these circumstances, the undigested food is commonly recognizable in the evacuations. Sympathetic disturbances are often also observed in the form of pyrexia and various nervous systems. Sometimes the diarrhœa is not an immediate result of the aepsia; but a chronic state of ill health arises, in which, as it is well described by Barthez, "the child grows pallid and emaciates, gets flabby and etiolated, loses its strength, cheerfulness, and appetite, and then, after some time, diarrhœa supervenes." Such children at times eat largely, but, notwithstanding, do not thrive. These forms of diarrhœa are well known to medical men, as occasioning a large proportion of our infantile mortality. The intestinal disturbance of aepsia is, however, not confined to childhood. In grown-up persons, as a direct result of it, we meet with flatulency of the intestines and diarrhœa; while, as an indirect result, a habitual costiveness is very commonly to be observed.

Inanition.

A further and more distant, but equally formidable result of this deficiency is inanition, more or less complete. The weakness of the digestive powers may be exhibited chiefly in this way; the food, taken without appetite, soon disgusts, and the meal is left scarcely tasted, or what is eaten produces no influence in renovating the strength, or supplying the waste of the body. This is a condition which is recognized as of common occurrence in the

advanced or convalescent stages of severe diseases. We would gladly furnish nutriment to our patient; but he either loathes the food which we present to him, or it fails to restore his powers. It cannot be doubted that this failure of gastric secretion is at the bottom of many instances of progressive chlorosis and prolonged debility, against which we oppose our customary remedies for a long time in vain.

It is to these various effects of *apepsia*, as resulting from deficient secretion or an imperfect quality of the gastric juice, that the method of treatment by artificial digestion is peculiarly applicable. There are cases also of acute disease which daily claim the most anxious attention of the practitioner, in which the great object at which he aims is to preserve his patient's life till nature has had time to effect her own work of reparation; where experience has satisfied him that, if life can be prolonged only for a limited period, recovery may be fairly anticipated; where, in fact, to gain time is to save life. There are cases also of disease in the digestive canal, where it may be of the first moment to afford nourishment to the patient, and at the same time so completely to utilise the aliment as to leave the smallest possible faecal residue. In both these classes of cases, the use of this method of treatment is clearly indicated; and in both, the best results may fairly be looked for from its adoption.

Suitable cases
for the adminis-
tration of Pep-
sine.

An immediate effect of the administration of a dose of Pepsine in appropriate cases of *dyspepsia*, is sometimes, but not invariably, noticed in the production of *appetite* which had previously been absent. A few doses, in most cases, are followed by an appetite for subsequent meals; and where but little food could be taken without disgust at the commencement of the treatment, it often happens that full meals are shortly taken with pleasure. In those instances where voracious appetite accompanies prolonged diarrhoea, from the *apepsia* of infancy, the appetite becomes reduced, as soon as the effect of the general improved nutrition becomes marked.

The relief and rapid disappearance of painful sensations after meals, is a more marked effect of the use of Pepsine in cases of *dyspepsia*, arising out of defective or imperfect secretion of the

Pain after meals

gastric juice ; and the same thing may be said of the arrest of the vomitings, which are due to the same cause, and also of the flatulent distensions that arise from the chemical decomposition of the aliment.

It is especially in cases where these disturbances succeed the use of animal food, that the employment of Pepsine is chiefly indicated. It often enables a patient, who has not dared to attempt it, and could not do so without suffering, at once to eat it with impunity. Nor is this operation tardy. The first dose usually in such instances produces an effect, and after two or three more no further discomfort is perceived. Even the severest cases of gastralgia after food, are almost as by a miracle relieved by its assistance. Where it fails to give relief to painful digestion, after three doses have been used, and still more so when future doses equally fail to assist the digestion, it is probable either that the dyspepsia does not arise from a defect of the gastric secretion, or that some other condition predominates as its cause, such as hyperæsthesia of the stomach, or atony of its muscular parietes.

Hyperæsthesia. Where *hyperæsthesia* is conjoined to any great extent, and where, although the painful digestion is relieved by the Pepsine, it does not completely disappear, a small proportion of hydrochlorate of morphia may be prescribed with each dose. This allays the sensitiveness of the stomach, and does not interfere with the operation of the Pepsine. Where *atony* prevails, the conjoint use of strychnia may be ordered.

Atony.

Acidity. It sometimes happens in dyspeptic cases, although acid is freely formed or secreted in the stomach, yet, that the Pepsine of the secretion is so deficient, that digestion is rendered imperfect.

Neutral Pepsine indicated. High acidity, in fact, of the contents of the stomach, shortly after a meal, is no proof that gastric juice is secreted of a quality adapted to transform the aliment. In these cases, if Pepsine be used, the neutral Pepsine is to be preferred.

Not palliative, but curative. But Pepsine does something more than act as a substitute for the natural secretion ; its use is shortly succeeded by a restoration of the function of the gastric glands. It is not a merely palliative remedy then, in dyspepsia, as some have feared it might prove,

and have consequently declined in my experience to avail themselves of its operation, but it is really curative.

Hence, after a few doses of the medicine, in the majority of cases, the quantity of the dose may be lessened without diminution of its effects, or its use may be limited to dinner or the principal meal of the day. In the less severe cases of dyspepsia, this is the only occasion in which it need be employed from the first—the digestive powers being restored so quickly, as to enable the patient to take meals of secondary importance without distress. The test of this restorative effect having been produced, is a temporary suspension of the medicine. After about six doses, it is not rarely found that digestion is in future perfectly accomplished, and the recurrence to the Pepsine is unnecessary. Should this happy result not follow, it is easy to resume its use. In some chronic and severe cases, advantage is decidedly gained by its employment daily for weeks or months. The presence of ulcer or hypermia of the stomach is no bar to the employment of Pepsine, but in either instance the ordinary treatment should be pursued until the more urgent symptoms are relieved, the proper time for using the Pepsine being that at which an improved diet is permissible. In the cases which have come under my care the amendment of the patients at this stage has been much more rapid, the strength regained more rapidly, and the relapses have been less troublesome than prior to the period when I began to use the Pepsine. I have also seen much benefit accrue from its employment even in cancer of the stomach, where the vomited matter plainly demonstrated that the healthy changes in the aliment did not take place, and when the stomach was manifestly dilated.

Practical
remarks.

In some cases in which I have prescribed it, I have found that the bowels, which were constipated previously, became more regular, and the stools softer under its use. In some, this has gone on to absolute relaxation of the bowels, with griping and borborygmi; but in no case has the debility of the patient been increased by this occurrence, and in all it ceased on the suspension of the medicine. In two instances, my patients have subsequently, on the recurrence of constipation, spontaneously resumed the use of small doses of Pepsine for its relief.

Diarrhœa.

Its operation, in those cases of *diarrhœa* and lientery in which these arise from a defective secretion of gastric juice, or such an atony as permits the food to pass out of the stomach, before sufficient gastric juice has been poured out for its digestion, is one of the most remarkable of its effects. It is well known how feeble have been the powers of medical art for the cure of these cases. In Pepsine we have a remedy whose efficacy in such cases is unequalled. Never has the truth of the maxim, "*sublatâ causâ tollitur effectus*," been more happily exemplified than in the narrative of some cases of this kind, treated with Pepsine. I would refer especially to the cases by Barthez, abstracts of which are given in my work. The improvement is at once seen in the reduction in number of the evacuations, the disappearance from them of undigested portions of food, and the general improvement of the embonpoint and vital powers of the patient. A few doses, as in cases of gastric disturbance, suffice to produce an amendment, and the medicine may soon be discontinued. In some instances, the state of diarrhœa is superseded by one of constipation. There is one great advantage also in this remedy in the treatment of infantile diarrhœa; and it is that the restrictions upon the diet of the young patient, either in respect of its quality or its quantity are less needed. In the ordinary mode of treating such cases, these restraints are the most essential items of the cure, and are felt to be most irksome both to the parents and the children.

The assistance derived from artificial digestion by Pepsine, is also a valuable addition to our catalogue of remedies for anæmia. Several cases that I have narrated in my work, illustrate this, and shew that the favourable action of the preparations of iron was not obtained until the digestive powers of the stomach were assisted and restored by this medicine.

Anœmia.

The condition of debility, which, whatever may be the local effects of indigestion, sooner or later succeeds to it, rapidly disappears as the work of the stomach is transacted for it, or as its power to perform its own functions is restored. But there are cases in which, although no local symptoms of indigestion may be manifested, we cannot doubt that the stomach is not in a state to undertake the duty of forming the nutriment which we know the

wants of the system demand. In the advanced stages of acute and severe diseases, we all know that the life of the patient is often dependent upon the amount of nutriment we can throw into the blood; and we are equally satisfied that the stomach partakes of the general condition of the debility and anæmia, of which we have the clearest evidence in the prostration and pallidity of the invalid; artificial digestion by Pepsine has, in these circumstances, undoubtedly been the means of preserving life. In addition to the cases which I have described in my work on "Artificial Digestion," I may mention a very interesting narrative of a case by Dr. Ross, of Inverness, in the October number of *The Edinburgh Medical and Surgical Journal*.

Believe me to remain, dear Sir, yours truly,

EDWARD BALLARD, M.D.

To MR. SQUIRE, 277, *Oxford Street*.

Dr. TODD has authorized me to state, that he has used Boudault's Pepsine with great benefit in many cases of dyspepsia, and also in cases of diabetes.

Dr. PROTHEROE SMITH has employed Boudault's Pepsine very largely. When first brought to his notice by Mr. Squire, he subjected it to the following tests:—Having selected forty-eight cases suffering from dyspepsia, he classified them under the following heads, viz. :—1. Gastrodynia and gastralgia. 2. Sickness, nausea and pyrosis. 3. Flatulence, gastric, and enteric.

Under one of these three divisions, as the case might be, he entered the name of each patient, and without restricting the diet, prescribed fifteen grains of Boudault's Pepsine, or "poudre nutritive," thrice daily before meals. At the end of a week he found the majority of these cases benefitted. In several instances, marked and steady relief was effected, followed after some time by increased bulk, and an improved state of the health generally. In some cases of distressing sickness, during the period of utero-gestation, he has noticed a marked benefit from the exhibition of this remedy; and in one case the relief was complete. In two cases, nausea and temporary loss of appetite followed the administration of fifteen grains of the Pepsine. Both these patients

were hysterical females, of the ages of twenty-three and twenty-seven. In one of them the remedy was afterwards employed advantageously in smaller (five grains) doses. In one case purging followed the use of this medicine, which was therefore suspended for a time, and afterwards resumed, with a similar result.

From his observation of the effects of this remedy, Dr. Protheroe Smith deduces, amongst others, the following practical conclusions :—

That Pepsine often relieves and sometimes cures hysterical vomiting, nausea, pyrosis, the sickness of pregnancy, gastric and enteric flatulency, gastrodynia, and gastralgia.

That by increasing and perfecting the powers of digestion and assimilation, it is valuable indirectly as a tonic, especially in subjects of delicate organism, and at the periods of infancy and old age.

That, as seen in two cases of phthisis and uterine cancer, it may be found for a time so to sustain the vital powers, as in some measure to postpone the fatal issue of malignant disease.

That, as a rule, it is best to commence in adults with five grains of the artificial Pepsine, than with a larger dose ; but that it may be advantageously increased gradually to fifteen grains or more.

That it is better to administer it at intervals during a meal, than to give it at once at the commencement. Thus, Dr. Protheroe Smith has often prescribed, with apparent advantage, five grains before, five grains in the middle, and five grains after dinner. So that the artificial Pepsine becomes gradually mixed with the food, simulating more the continuous secretion of gastric juice during the process of digestion.

That he has found it beneficial to mix the “poudre nutritive” with glycerine, flavoured with orange peel or raspberry syrup ; Dr. Protheroe Smith having observed in some cases, that thus flavoured and combined with glycerine, it was not only more agreeable to the taste, and preserved from decomposition, but that its digestive and nutritive powers were sensibly augmented.

To MR. SQUIRE, 277, Oxford Street..

